therefore, be other kinds of *nidus* to harbour the larvæ of *Musca domestica* through the winter.

Monreith. HERBERT MAXWELL.

The Magnetic Storm of August 11–12, 1919.

THE Kodaikanal Observatory magnetographs recorded the "sudden commencement" of this storm on August 11 at 6h. 58m. G.M.T., horizontal force showing an instantaneous rise of 149 γ and vertical force about 35 γ, while the declination magnet was deflected about 1′ towards west. I have measured the three traces, and, after making due allowance for the errors affecting the hour-marks, the following values were obtained:—

	h.	m.
Horizontal force	6	58·0
Vertical force	6	58·7
Declination	6	57·9

Greater weight may be given to the declination result because of the more sharply defined hour-marks in this trace.

It is of interest to compare this result with the times recorded in England in view of the fact that at Kodaikanal the sun at 6h. 58m. G.M.T. was barely three minutes past meridian passage and only 5° north of the zenith. In other words, this observatory was almost at the centre of the earth's disc as seen from the sun, and it might be supposed that the disturbance would have been recorded here earlier than at other places if it is directly due to emanations from the sun.

Apparently the sudden commencement was recorded at Kew "at about 7h. G.M.T.," and at Stonyhurst at 6h. 50m., while at Eskdalemuir the time is given definitely as 6h. 58m., in exact agreement with my result (NATURE, vol. ciii., pp. 483, 505 and 506).

It seems probable that the impulse is simultaneous over the earth to within a fraction of a minute, but it would be interesting to know the limits of error to which the above times are subject, and particularly whether allowance has been made for the rather large error which may be produced by the mechanism for cutting off the light from the sensitive paper at each hour. J. EVERSHED.

Kodaikanal, S. India, November 25.

Deflection of Light during a Solar Eclipse.

DURING a total eclipse of the sun there will be, as I suppose, an increase of density of the air at the central portion of the shadow. If we imagine the normal atmosphere removed, we are left with a residual atmosphere the refraction effects of which will be changes in the normal refraction effects. The whole point is whether, on reasonable suppositions, this residual atmosphere can produce refraction effects of the order of the observed effects that have been attributed to the gravitational field of the sun.

Let us suppose with Prof. Eddington that the portion of this residual atmosphere concerned corresponding to a star near the edge of the sun's disc has a radius of about 150 yards, and let the index of refraction of the residual atmosphere at the central part be μ_2, and that at the circumference μ_1. Then, as I have shown, the displacement will be accounted for if

$$\mu_2=\mu_1\left(1+\frac{7}{10^8}\right).$$

Assuming that the change of density depends only on change of temperature, we have

$$\frac{\rho_2}{\rho_1}=\frac{\theta_2}{\theta_1}=\frac{\mu_2-1}{\mu_1-1},$$

where ρ_2, ρ_1, θ_2, θ_1 are the increases of density and falls of temperature at the centre and circumference.

Thus we have, approximately,

$$\frac{\theta_2-\theta_1}{\theta_2}=\frac{7}{10^8(\mu_2-1)};\quad \frac{\theta_2-\theta_1}{\theta_1}=\frac{7}{10^8(\mu_1-1)}.$$

We must now make some assumption as to the gradient of temperature, and this is a very important point. It would not, I think, be right to make it uniform or approximately uniform throughout a distance of 150 miles. We will assume that in a distance of 150 yards the increase of temperature is 1/100th part of θ_2. This does not seem to be unreasonable.

We then have $\mu_2=1{\cdot}000007$ for the index of refraction of the residual atmosphere at the centre, corresponding to a lowering of temperature of 6·28° C. at the centre and of 6·22° C. at a distance of 150 yards. If we assume that the increase of temperature at a distance of 150 yards is 1/10th of θ_2, we get the fall at the centre 0·63° C. and that at 150 yards' distance 0·57° C. It will be seen that the greater $\frac{\theta_2-\theta_1}{\theta_2}$, the smaller is the necessary fall of temperature at the centre. ALEXR. ANDERSON.

University College, Galway, December 28.

Entente Scientific Literature in Central Europe during the War.

I WAS much interested in reading Prof. Brauner's letter from Prague in NATURE of December 11. Like Prof. Brauner, I was unable to obtain NATURE during the first two years of the war, and I fully appreciate his joy on obtaining your invaluable journal again, after an interval of more than five years.

Prof. Brauner states that from July 30, 1914, "the Austrian Government prohibited for more than four years the circulation of anything printed in England as a punishment for the regard which, especially during the war, we [the Czechs] have always had for your country."

This statement is misleading, for "enemy" periodicals were withheld from the whole of the Austrian Empire, and not from the Bohemians alone. Prof. Brauner is apparently unaware of the fact that, from 1916 onwards, it was possible for institutes of the Austrian universities and technical high schools to obtain scientific periodicals and publications from Entente countries. The enactment which made this possible did not appear to be generally known, but I am aware of two institutions at least, which made application for, and obtained from the Austrian Foreign Office, the necessary permission; and in neither instance was any difficulty experienced.

The Radium Institute of Vienna was one of the institutions concerned, although at that time several Poles (one of them a Russian subject) and the writer of this letter were working there. What is more, the Austrian Foreign Office was not unaware of this "quasi-international" character of the Radium Institute!

Books were also obtainable, and I know of several men of science of Vienna, Budapest, and even of Prague, who were granted permission and obtained books from France and England through neutral countries.

A few months before the armistice I remember sitting in a Viennese restaurant at the same table as a gentleman, who was voraciously devouring the contents of the *Sketch* and the *Illustrated London News.* To judge from his frequent unsuppressed laughter, one would have thought he was scanning the pages of *Punch.* Not having seen these periodicals for nearly five years, my interest and curiosity were aroused, and I asked this gentleman's permission to

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see them. His reply was very emphatic: "Das ist ja ganz unmöglich!" I gathered from his further conversation that he belonged to the Intelligence Bureau of the Austrian Foreign Office, and that his work consisted in reading such journals. I envied him, but could not suppress my feelings of astonishment at his reading such "ganz geheimen Dokumente" in a public restaurant.

It may be mentioned in conclusion that Germany was much more liberal than Austria about the circulation of Entente publications. At least until the later months of the war, it was possible to go into any of the larger *cafés* of the German cities and enjoy a cup of coffee-substitute over a copy of the *Times, Le Temps, Secolo,* and various other newspapers of the Allied countries.

Robert W. Lawson.

The University, Sheffield, December 17.

Royal Meteorological Society's Phenological Returns.

With 1920 the phenological returns complete the thirty years, which period is a recognised critical epoch in meteorological records.

In consequence of the war, our observing stations fell to 110 in 1918, against the high-water mark of 132 in 1914. We are most anxious now to recover lost ground, and would in this respect like to make 1920 preparatory to the years to follow.

A reasonable total would include at least 220 stations, an average of twenty only for the eleven Meteorological Office districts. At present we are short of this in all but South-east England and the Midlands. The six districts forming Scotland, Ireland, and North-east England average only 3½ each. Wales has two stations only, both in the south-west.

The observations asked for refer to the blooming of thirteen common flowers and the appearances of six birds and six insects. Other migrant records and notes are also invited, but these are of secondary importance.

A copy of the observing form and of a recent report will be sent with pleasure (the reports so far as they are available) to any readers of Nature who would be interested to help.

We especially suggest the value for all interested in Nature-study and regional survey classes.

Inquiries should be addressed to one of us, or to the Assistant Secretary, Royal Meteorological Society, 70 Victoria Street, S.W.1.

H. B. Adames,
33 Holcombe Road,
Ilford, Essex.
J. Edmund Clark,
"Asgarth," Purley,
Surrey.

Einstein's Theory and a Map Analogue.

I am grateful to the Director-General of the Ordnance Survey for directing my attention to an inaccuracy in my article in Nature of December 11, p. 375. It was there stated that it is not possible to strain a map of the earth's surface so that all great circles become straight lines.

This is clearly contrary to the known fact of the central projection. As a matter of fact, the sphere is one of the limited class of surfaces for which it is possible to strain all geodesics into straight lines. For an arbitrary surface this is not true. The difference between the properties of the sphere and of the general surface gives a fair indication of the geometrical notions at the back of Einstein's theory.

E. Cunningham.

THE SUN DANCE OF THE TETON SIOUX.

As man advances in the scale of culture he loses his dependence on Nature. The dweller in a modern city relies chiefly on artificial means for his pleasure and comfort, but the American Indian realised that his whole success depended on his co-operation with natural forces. He studied his surroundings and evolved a system of reasoning by which he attempted to explain them. A thoughtful Sioux Indian said to the writer: "When we see the changes of day and night, the sun, moon, and stars in the sky, and the changing seasons upon the earth, with their ripening fruits, anyone must realise that it is the work of someone more powerful than man. Greatest of all is the sun, without which we could not live. The birds and the beasts, the trees and the rocks, are the work of some great power."[1] Having recognised a creative power with the sun as its most important manifestation, it was a natural step in native logic to regard the sun with a reverence that is best expressed by the word "worship."

While the worship of the sun, in various forms, was widespread among the Indians of North America, the sun dance was a ceremony the observance of which was limited to certain plains tribes. The sun dance among the Santee Sioux differed in some respects from that of the Teton Sioux, which is herewith presented, but the underlying idea is the same. The sun dance was "the first and only religion of the Sioux," and even at the present time it is considered too sacred a subject for ordinary conversation. At the opening of the writer's study a member of the tribe said: "If we were to talk of the sun dance there should be at least twelve persons present, so that no disrespect would be shown, and no young people should be allowed to come from curiosity."

The purpose of the sun dance was the public offering to Wakaŋ'taŋka (Great Mystery) of what was strongest in the nature and training of the Indian—namely, his ability to endure physical pain. He did this in fulfilment of a vow made in time of great anxiety or danger, usually when on the warpath. The time of the sun dance was the full moon of midsummer, "when all Nature and even man is rejoicing." Into this joy and beauty, as though to give a greater contrast, the Indian projected his personal suffering. For a month before the sun dance it was customary for the medicine men to "pray for fair weather," singing their songs of magic power, burning sweet grass, and offering their pipes to the sky, the earth, and the cardinal points as they made their petitions. It is said that the oldest men cannot remember the falling of rain during a sun dance.

From long distances the people came and made their camp in a great circle. The dance enclosure was in the centre of this circle, and was about 50 ft. in diameter. Around it was erected a shelter

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[1] "Teton Sioux Music." By Frances Densmore. Bulletin 61, Bureau of American Ethnology, Smithsonian Institution, Washington, D.C., p. 96. Other direct quotations, as well as the facts herein presented, are from the same work. The Bureau of American Ethnology has kindly given permission to reproduce the illustrations used in this article.

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